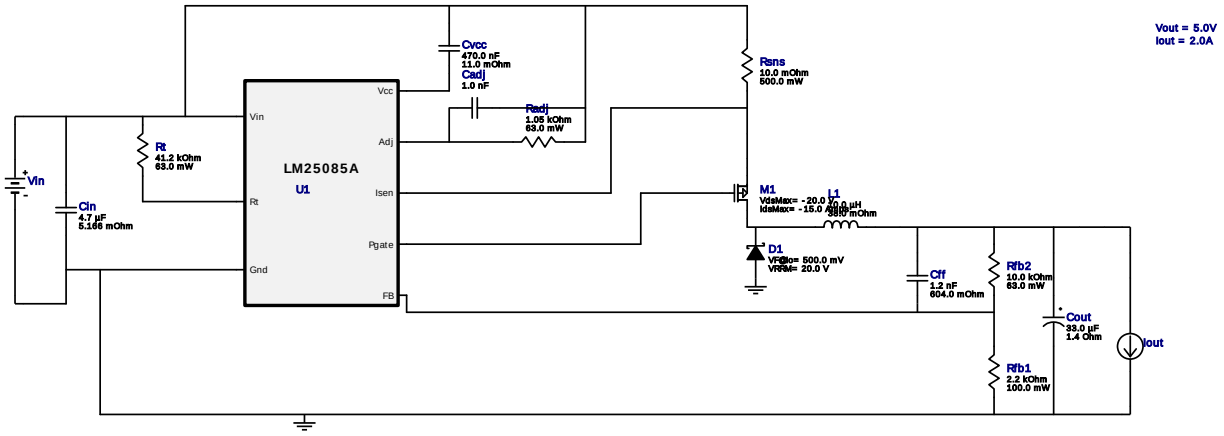
WEBENCH® Design Report

VinMin = 12.0V
VinMax = 14.0V
Vout = 5.0V
Iout = 2.0A

Device = LM25085AMY/NOPB
Topology = Buck
Created = 7/20/16 7:29:37 AM
BOM Cost = $1.79
BOM Count = 14
Total Pd = 0.93W

Design : 4077713/43 LM25085AMY/NOPB
LM25085AMY/NOPB 12.0V-14.0V to 5.00V @ 2.0A



Electrical BOM

#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
1.	Cadj	Samsung Electro-Mechanics	CL21C102JBCNFNC Series= C0G/NP0	Cap= 1.0 nF VDC= 50.0 V IRMS= 0.0 A	1	$0.01	0805 7 mm²
2.	Cff	Kemet	C1206C122K5RACTU Series= X7R	Cap= 1.2 nF ESR= 604.0 mOhm VDC= 50.0 V IRMS= 164.0 mA	1	$0.06	1206 11 mm²
3.	Cin	MuRata	GRM21BC81E475KA12L Series= X6S	Cap= 4.7 uF ESR= 5.166 mOhm VDC= 25.0 V IRMS= 2.03531 A	1	$0.02	0805 7 mm²
4.	Cout	Vishay-Sprague	293D336X9010C2TE3 Series= 293D	Cap= 33.0 uF ESR= 1.4 Ohm VDC= 10.0 V IRMS= 280.0 mA	1	$0.14	6032-28 42 mm²
5.	Cvcc	AVX	0805YC474KAT2A Series= X7R	Cap= 470.0 nF ESR= 11.0 mOhm VDC= 16.0 V IRMS= 0.0 A	1	$0.02	0805 7 mm²
6.	D1	Diodes Inc.	B220-13-F	VF@Io= 500.0 mV VRRM= 20.0 V	1	$0.08	SMB 44 mm²
7.	L1	TDK	VLP8040T-100M	L= 10.0 µH DCR= 38.0 mOhm	1	$0.22	VLP8040 113 mm²
8.	M1	Texas Instruments	CSD25402Q3A	VdsMax= -20.0 V IdsMax= -15.0 Amps	1	$0.34	TRANS_NexFET_Q3A 18 mm²
9.	Radj	Vishay-Dale	CRCW04021K05FKED Series= CRCW..e3	Res= 1.05 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm²
10.	Rfb1	Yageo America	RC0603FR-072K2L Series= ?	Res= 2.2 kOhm Power= 100.0 mW Tolerance= 1.0%	1	$0.01	0603 5 mm²

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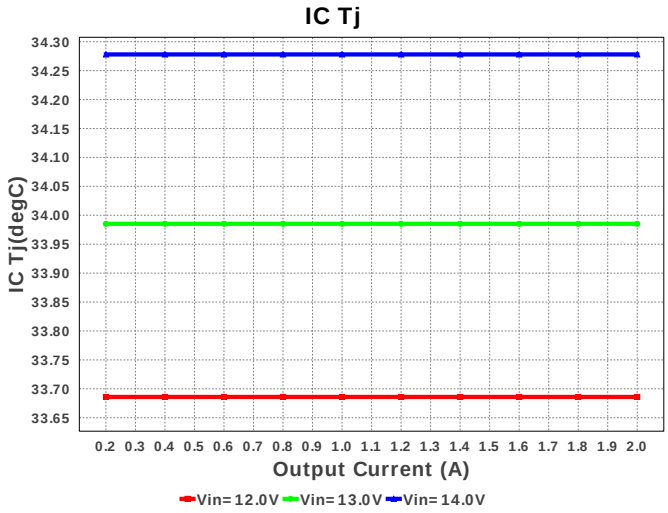
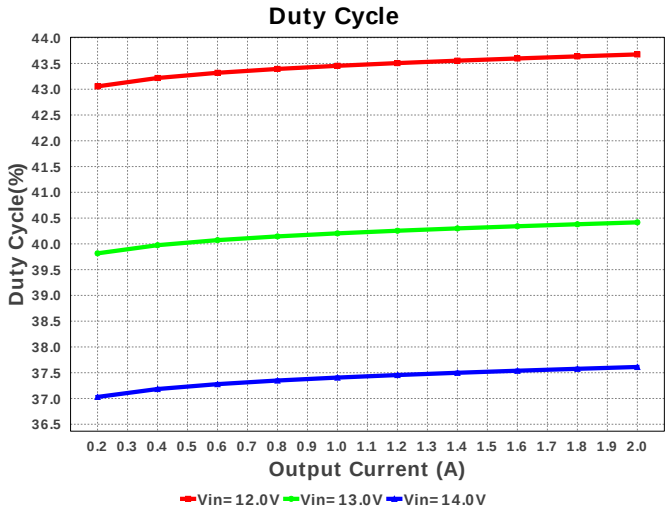
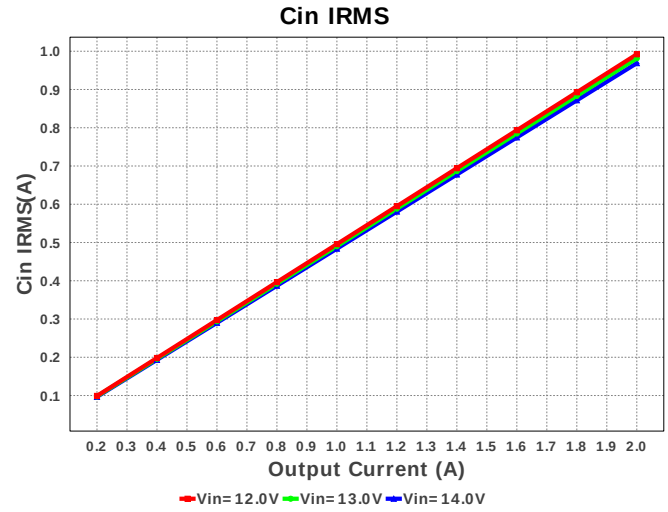
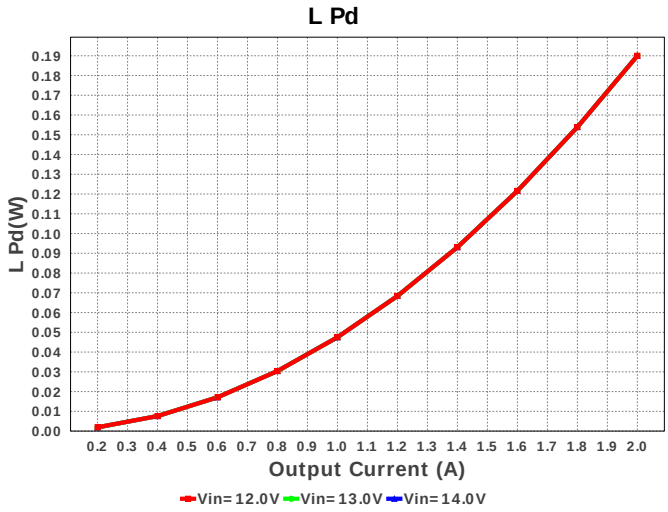
#	Name	Manufacturer	Part Number	Properties	Qty	Price	Footprint
11.	Rfb2	Vishay-Dale	CRCW040210K0FKED Series= CRCW..e3	Res= 10.0 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
12.	Rsns	Stackpole Electronics Inc	CSR1206FK10L0 Series= ?	Res= 10.0 mOhm Power= 500.0 mW Tolerance= 1.0%	1	$0.11	1206 11 mm^2
13.	Rt	Vishay-Dale	CRCW040241K2FKED Series= CRCW..e3	Res= 41.2 kOhm Power= 63.0 mW Tolerance= 1.0%	1	$0.01	0402 3 mm^2
14.	U1	Texas Instruments	LM25085AMY/NOPB	Switcher	1	$0.75	MUY08A 24 mm^2









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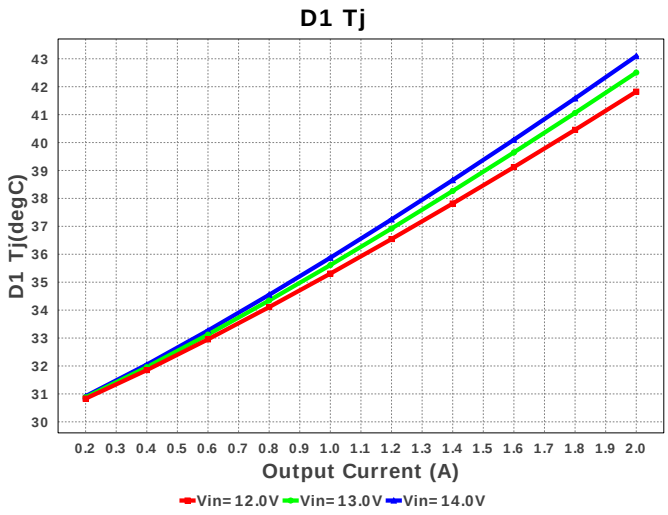

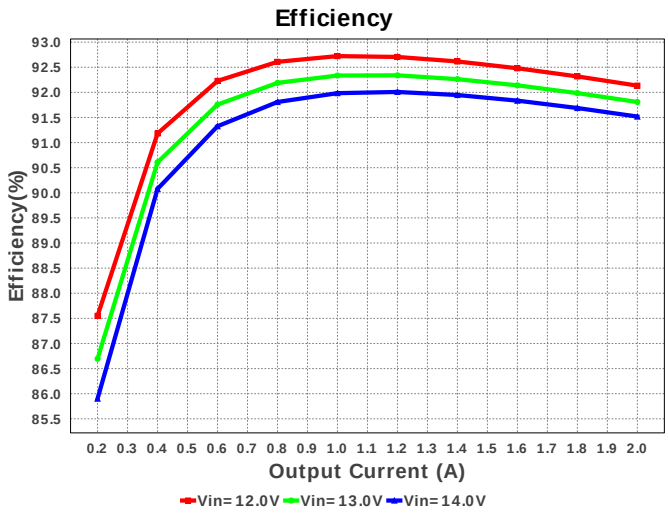

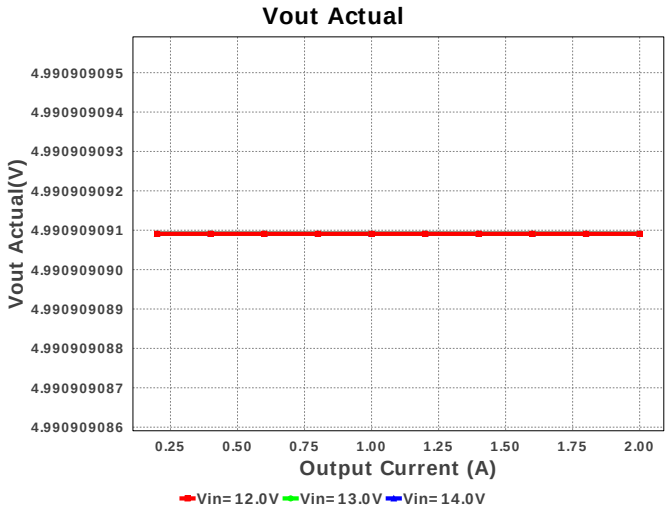

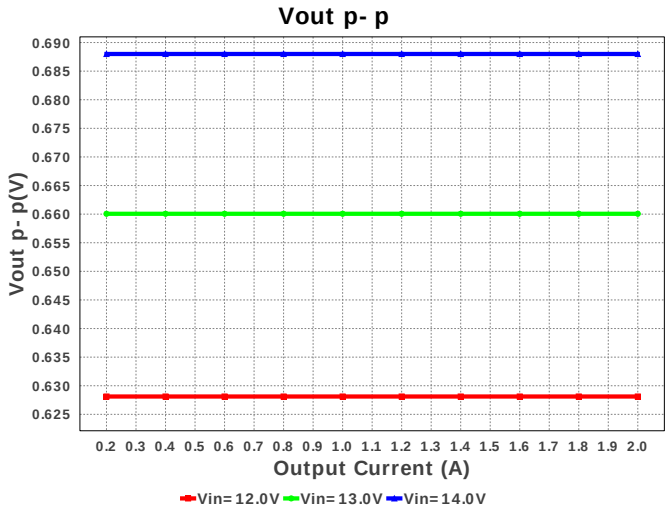

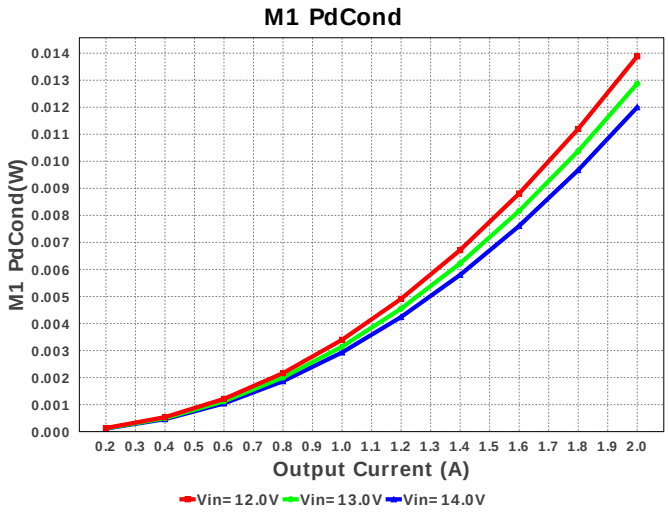

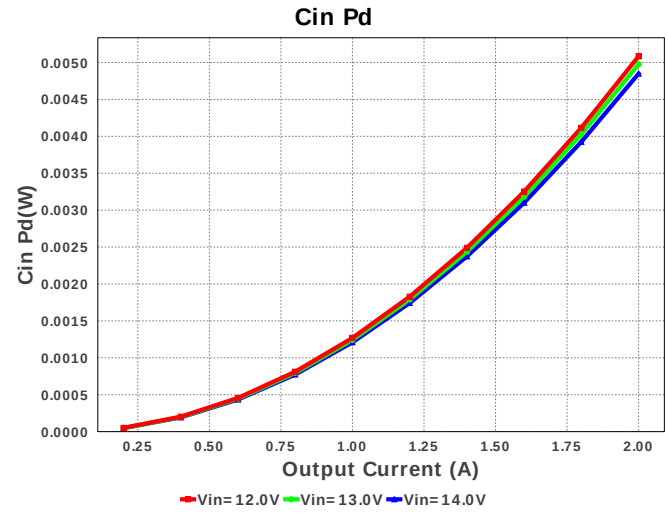

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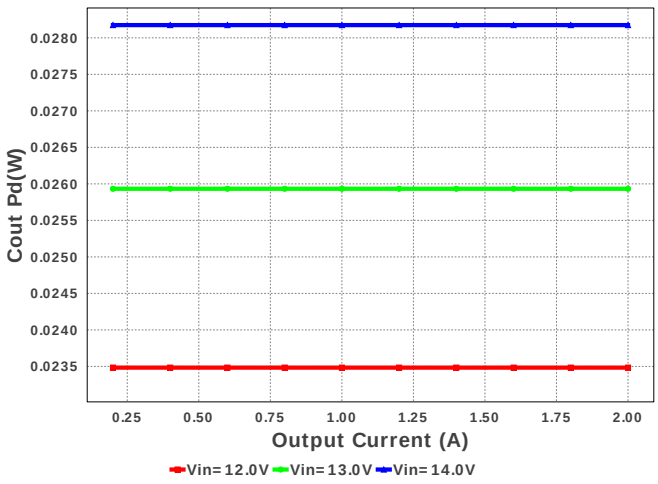
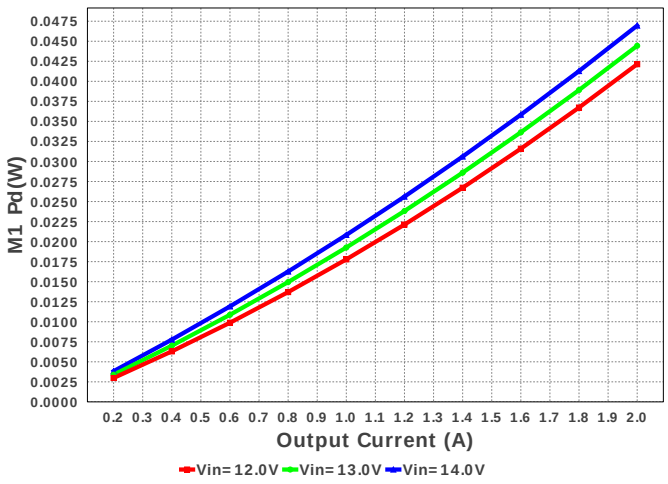
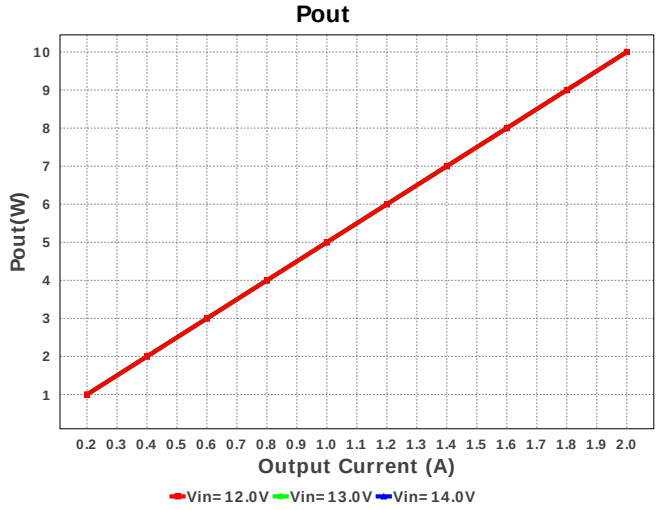
Cout Pd



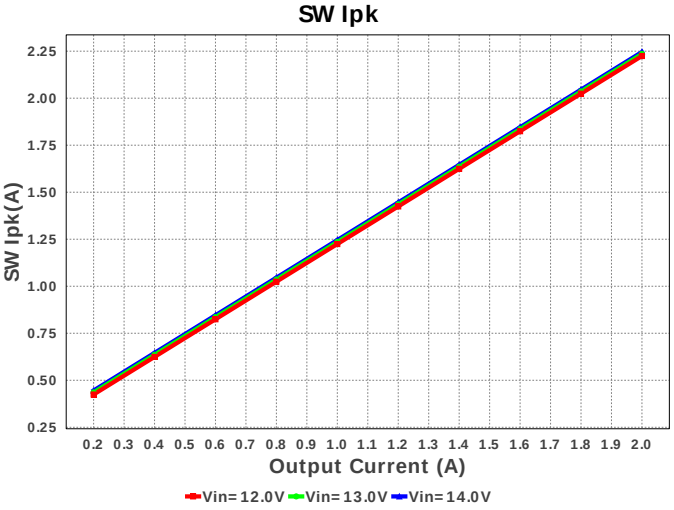
M1 Pd



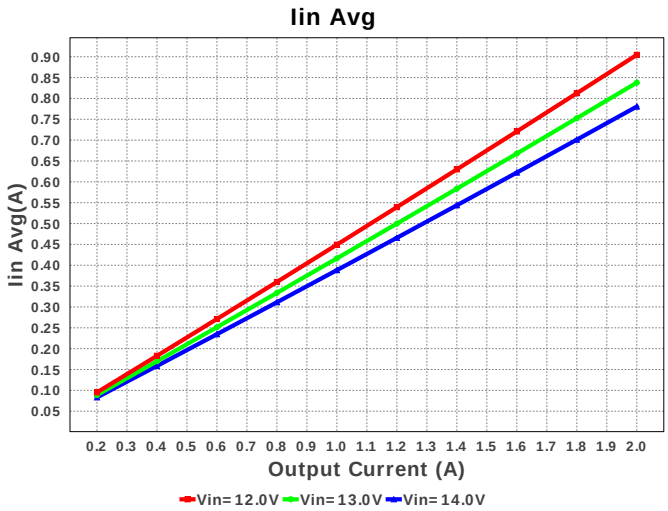
Pout



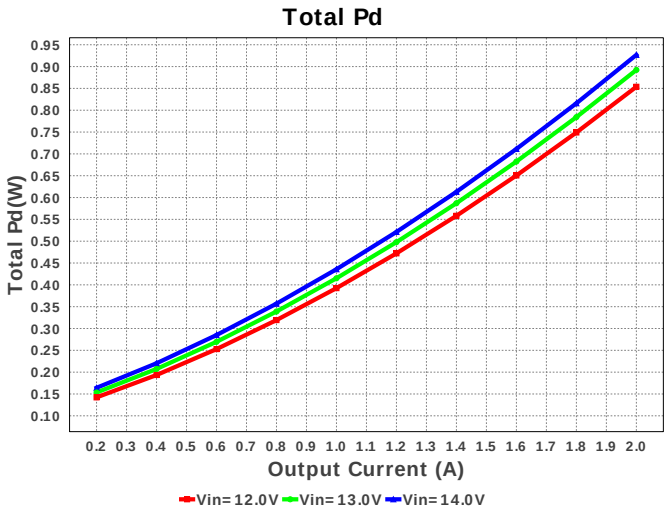
SW Ipk



Iin Avg



Total Pd



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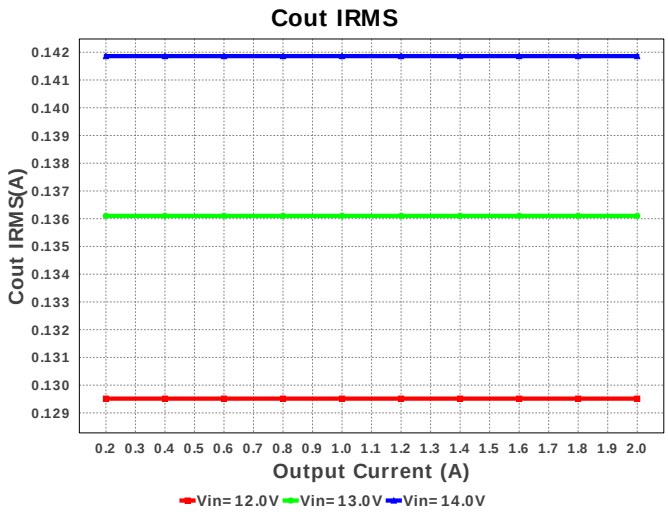

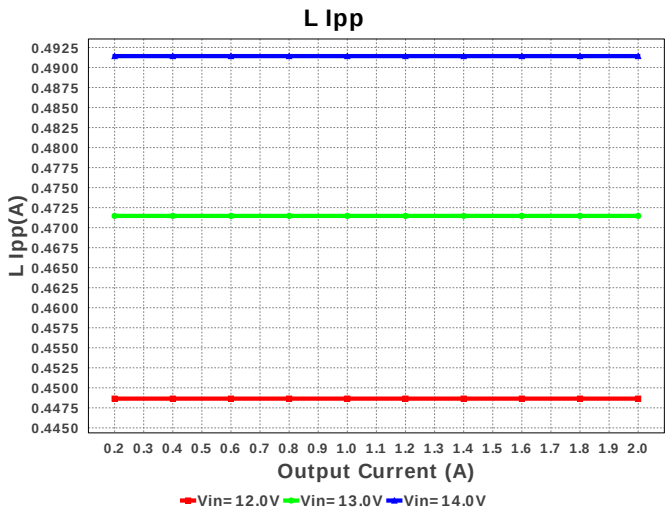

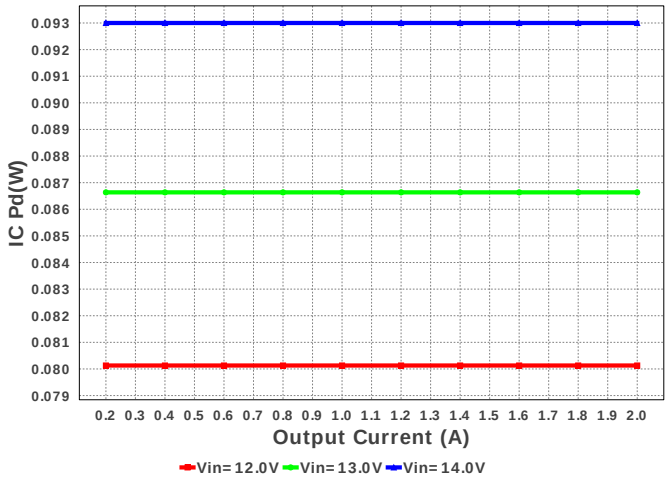

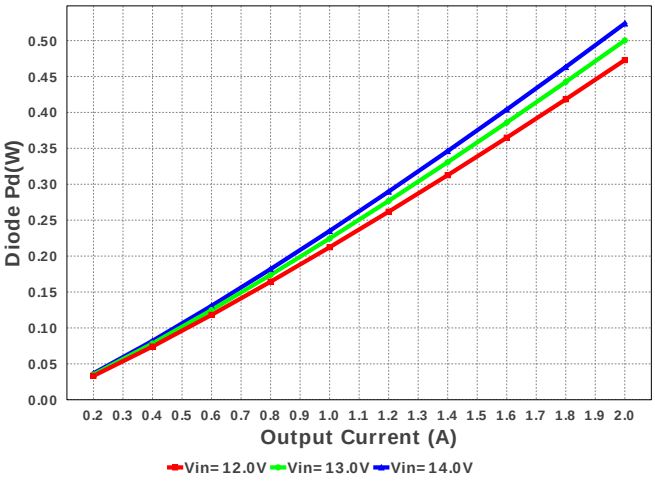

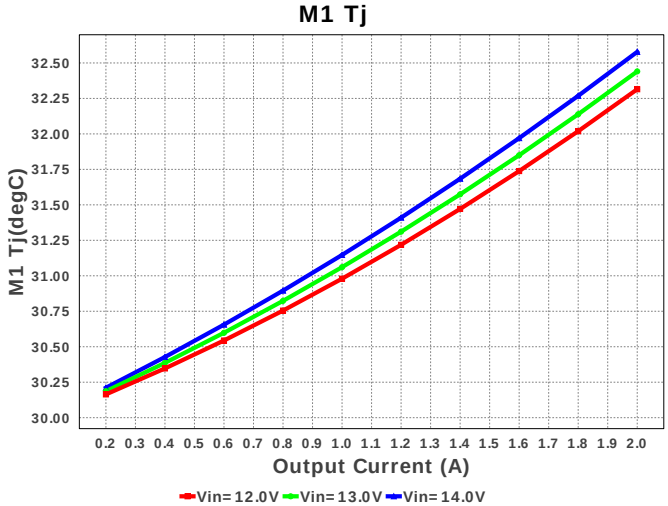

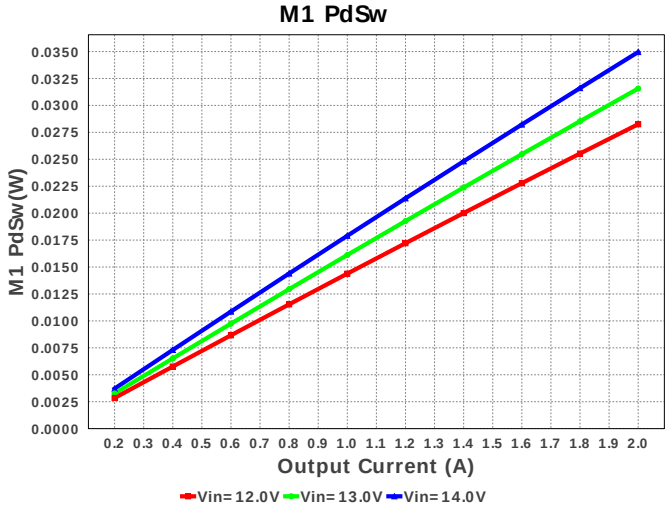

Operating Values

#	Name	Value	Category	Description
1.	Cin IRMS	968.818 mA	Current	Input capacitor RMS ripple current
2.	Cout IRMS	141.861 mA	Current	Output capacitor RMS ripple current
3.	Iin Avg	780.48 mA	Current	Average input current
4.	L Ipp	491.42 mA	Current	Peak-to-peak inductor ripple current
5.	SW Ipk	2.246 A	Current	Peak switch current
6.	BOM Count	14	General	Total Design BOM count
7.	FootPrint	297.0 mm^2	General	Total Foot Print Area of BOM components
8.	Frequency	599.208 kHz	General	Switching frequency
9.	IC Tolerance	18.0 mV	General	IC Feedback Tolerance
10.	Pout	10.0 W	General	Total output power
11.	Total BOM	$1.79	General	Total BOM Cost

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#	Name	Value	Category	Description
12.	D1 Tj	43.096 degC	Op_Point	D1 junction temperature
13.	Vout Actual	4.991 V	Op_Point	Vout Actual calculated based on selected voltage divider resistors
14.	Vout OP	5.0 V	Op_Point	Operational Output Voltage
15.	Duty Cycle	37.611 %	Op_point	Duty cycle
16.	Efficiency	91.518 %	Op_point	Steady state efficiency
17.	IC Tj	34.278 degC	Op_point	IC junction temperature
18.	ICThetaJA	46.0 degC/W	Op_point	IC junction-to-ambient thermal resistance
19.	IOUT_OP	2.0 A	Op_point	Iout operating point
20.	M1 Tj	32.578 degC	Op_point	M1 MOSFET junction temperature
21.	VIN_OP	14.0 V	Op_point	Vin operating point
22.	Vout p-p	687.998 mV	Op_point	Peak-to-peak output ripple voltage
23.	Cin Pd	4.849 mW	Power	Input capacitor power dissipation
24.	Cout Pd	28.175 mW	Power	Output capacitor power dissipation
25.	Diode Pd	523.824 mW	Power	Diode power dissipation
26.	IC Pd	93.0 mW	Power	IC power dissipation
27.	L Pd	190.0 mW	Power	Inductor power dissipation
28.	M1 Pd	46.924 mW	Power	M1 MOSFET total power dissipation
29.	M1 PdCond	11.97 mW	Power	M1 MOSFET conduction losses
30.	M1 PdSw	34.954 mW	Power	M1 MOSFET switching losses
31.	Total Pd	926.804 mW	Power	Total Power Dissipation
32.	Vout Tolerance	3.689 %		Vout Tolerance based on IC Tolerance (no load) and voltage divider resistors if applicable

Design Inputs

#	Name	Value	Description
1.	Iout	2.0	Maximum Output Current
2.	VinMax	14.0	Maximum input voltage
3.	VinMin	12.0	Minimum input voltage
4.	Vout	5.0	Output Voltage
5.	base_pn	LM25085A	Base Product Number
6.	source	DC	Input Source Type
7.	Ta	30.0	Ambient temperature

Design Assistance

1. For a Constant On Time device to be stable, we need to provide a ripple at the feedback comparator. There are various methods to implement the ripple. Depending on the circuit complexity vs. the allowable ripple, we have three options to choose from. The simplest option, 'Low Complexity', would require only a high ESR cap at the output. This means that the BOM count will be small, but the output voltage ripple will be quite large. The 'optimal solution' would require a feed-forward cap in parallel with the upper feedback resistor to AC couple the ripple to the feedback node. This increases the BOM count slightly, but now we have more control over the output voltage ripple. If the output voltage requirement is very tight, then the best option is to go for the 'Low Output Ripple' solution. In this option we can go with very low ESR output caps and have very good control over the output voltage ripple

2. **LM25085A** Product Folder : http://www.ti.com/product/LM25085A : contains the data sheet and other resources.

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